when the arm is in the closed position; and configuring the orifice leading to the port to have a small opening to allow leakage of fluids.

[0205] In a particular embodiment of the invention directed toward the leakage of volatiles below the set point of the backpressure regulator, the port **1410** has a small notch **1420** as shown in FIG. **26**A and the close-up of region C of FIG. **26**A depicted in FIG. **26**B. Thus, when a stop is in contact with the port **1410**, when the arm of the back-pressure regulator is in the closed position, a leak vent is present that allows a small leakage through notch **1420**. In another particular embodiment of the invention, orifice **1510** has a small opening **1520**, as depicted in FIG. **27**A and blow up of region E of FIG. **27**A depicted in FIG. **27**B. The opening **1520** is configured such that a leak vent is present when the stop covers the port **1510** since fluids may leak through the opening **1520**.

[0206] Various features of a backpressure regulator consistent with embodiments of the invention may be altered or modified. For example, stops to be used with backpressure regulators may have any shape, size, or mass consistent with desired operating conditions, such stops need not be ball-shaped as shown in some embodiments of the invention discussed herein. As well, stops of different weight but similar sizes may be utilized with the retainer to alter the set point of the regulator. Similarly, counter masses of different sizes, shapes and masses may be utilized with embodiments of the invention as long as they are accommodated by the axis and arm configurations (compare **1180** in FIGS. **23**A and **23**B with **1280** in FIGS. **24**A and **24**B); such counter masses may be attached and oriented relative to the arm by any of a variety of techniques apparent to those skilled in the art. The pivot pin placement need not be positioned as shown in FIGS. **23** and **24**, but may be positioned wherever advantageous to provide the mechanical advantage required to achieve a particular pressure set point.

[0207] Embodiments of the invention may optionally utilize the drain orifice feature described earlier. Also, embodiments of the invention may not utilize the counter mass force adjustment feature, relying on the specific properties of a stop to provide the set point for the backpressure regulator.

[0208] Other embodiments of the invention may not utilize a vessel, but rely on orifices that are intrinsically part of the system. In such instances, the backpressure regulator arm may be directly attached to a portion of the system such that the arm, stop, and counter mass are appropriately oriented for the operation of the regulator.

[0209] Cassettes suitable for use in the present liquid distillation system include valve cassettes disclosed in U.S. Pat. No. 6,464,667 the entire contents of which are incorporated by reference herein. The valve cassette, which is preferably pneumatically operated by a control assembly, includes various combinations of membrane-based chambers and valves. The cassette preferably includes, along the fluid passage through the cassette, one or more membrane based valves. A first and second rigid member are in an open position with respect to each other, with a sealing member defining an aperture through which fluid communication is provided. The membrane defines the valving chamber and the second membrane-based valve is preferably resilient, so that the valving chamber may provide a supply of pressurized fluid, when the valve is closed.

[0210] In the preferred embodiment valve stations are closed on the back side of the cassette, except that each valve station includes a pair of through holes for ports. One port communicates with a selected liquid path on the back side of the cassette, the other port communicates with another selected liquid or pneumatic path on the back side of the cassette.

[0211] It is preferred that the valve be made by molding a resilient material about and to the second rigid member so as to form an aperture sealing member about the port on the complementing surface of the second rigid member, and then assembling the first and second rigid members, which are preferably molded out of a rigid material, so as to bring the complementing surfaces adjacent each other and so that the sealing member is urged against the complementing surface of the first rigid surface.

[0212] In a preferred version of the cassette, which is primarily made out of rigid material, the membrane for the membrane-based valves is disposed adjacent the housing, such that the rigid housing and the membrane define a valving chamber. One passage enters the valving chamber at a first mouth located at the end of a protrusion of the rigid housing and the valving chamber toward the membrane and the valve may prevent the flow of fluid therethrough when the membrane is forced against the first mouth, by the control unit.

[0213] Embodiments described in the above references pump fluid using a valve cassette such as shown in FIG. **43**, a front view of an assembled exemplary pump cassette **5602** in accordance with an embodiment of the present invention. The pump cassette **5602** is essentially a rigid core including formations (see FIG. **44**) constituting the various ports **5604-5615**, chamber **5633**, valves **5620-5626**, and fluid pathways (channels) **5750** (see FIG. **44**) In this embodiment, chamber **5633** may be a pumping or a mixing chamber.

[0214] As can be seen in FIG. **44**, fluid pathways/channels **5750** so the fluid can flow through the various ports **5604-5615**, chamber **5633**, and valves **5620-5626**. The rigid core is covered on each side by a flexible membrane **5800** depicted in FIG. **45**, which may be, without limitation, a flexible PVC sheet or a silicone membrane. The flexible membranes seal against the core of each valve and isolate the control assembly from fluids within the cassette.

[0215] The pump cassette **5602** is typically designed to interface with the control assembly in one or more directions, as needed. Pump cassette **5602** depicted in FIGS. **43** and **44** is designed to interface with the control assembly in a single direction. For example, a pump cassette such as **5602** will typically include an asymmetric feature, such as placement of tubing, or other interlock that prevents pump cassette **5602** from being inserted into the system incorrectly. Pump cassette **5602** may preferably also include a top rib (not shown) that limits vertical travel of the pump cassette **5602** when the pump cassette **5602** is installed in a pump, as well as a peripheral rib (not shown) extending along portions of the sides and bottom of pump cassette **5602** that is used to hold the cassette within a cassette receptacle.

[0216] The various valves **5620-5626** depicted in FIG. **43** are commonly referred to as "volcano" valves and are used to open and close various fluid pathways within pump cassette **5602**. The volcano valves and the pumping chambers may be operated pneumatically from the rear of pump cassette **5602**, as discussed below.

[0217] A control assembly capable of operating the pump cassette **5602** is utilized in conjunction with pump cassette